DOCUMENT RESUME

ED 245 890 SE 044 623

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TITLE Project WILD Evaluation Final Report of Field Test.
INSTITUTION Western Regional Environmental Education Council.
PUB DATE 1 Jul 83
NOTE 71p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Academic Achievement; *Attitude Change; Elementary Secondary Education; Environmental Education; *Field Tests; Learning Activities; *Program Effectiveness; Program Evaluation; Program Implementation; *Student Attitudes; Teacher Attitudes; *Wildlife
IDENTIFIERS Environmental Education Research; *Project WILD

ABSTRACT

The primary purpose of this evaluation was to discover what effect Project WILD had on students and teachers. These effects included changes in student learning and attitudes about wildlife as well as teachers' reactions to the Project WILD implementation and materials. The project was field tested in three states, in three demographic areas (rural, suburban, and urban), and across all elementary and secondary grade levels. Subjects included 259 teachers and over 6000 students. A comparison was also made of the two methods of disseminating project materials to find out which was best for students and teachers. Results indicate that the project had a definite impact on students and teachers. Students showed significant gains in learning and developed attitudes toward wildlife that were consistent with project goals. Teachers found the activities stimulating and worthwhile in their classes, and were able to integrate them into their curricula. However, effects of the project were not uniform. Secondary teachers and students experienced only limited success with the project compared to elementary teachers and students. Six recommendations are offered based on these and other findings. (Evaluation instruments used are included in an appendix.) (JN)

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PROJECT WILD EVALUATION
FINAL REPORT
OF
FIELD TEST

JULY 1, 1983

M. Lynette Fleming

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INTRODUCTION

Purpose of the Evaluation

The primary purpose of this evaluation was to discover what effect Project WILD had on students and teachers. These effects included changes in student learning and attitudes about wildlife as well as teachers' reactions to the Project WILD implementation and materials. The project was field tested in three states, in three demographic areas (rural, suburban and urban), and across all elementary and secondary grade levels. Two hundred and fifty-nine teachers and over six thousand students were involved in the three states. Examining results across these three divisions made it possible to discover how generalizable the findings were. A comparison was also made of the two methods of disseminating Project WILD materials to find out which was best for students and teachers.

State Selection

States were selected based on sponsorship of Project WILD; location in the East, West and Rocky Mountain states; having an urban population over 200,000 and distinct suburban and rural populations; and the willingness of one of the sponsoring agents within the state to act as a recruiter and coordinator during the field test. The states of Colorado, Virginia, and Washington were selected because they met those qualifications.

District Selection

Because teachers in the various groups (control, materials, and workshop) were not to be at the same schools, at least three high schools were required per rural, suburban, and urban area. Most rural districts do not have three high schools, so three rural districts were needed in each of the states to get enough high school students to provide a reasonable sample.

State Coordinators, therefore, had the task of recruiting five school districts to participate. In each state this process occurred in a number of ways: meetings, phone calls, advertisement at conferences, and trips to individual districts to discuss the process with superintendents, principals, and teachers.

In each state, some school districts committed to participate and then withdrew. In Washington, especially, district cooperation was difficult to secure. This problem had an effect on the kind of teachers who participated in the field test, which will be discussed in greater detail in the issues section.

To reduce the number of districts required, workshop and materials teachers from the same schools participated, thus only two high schools were required per rural, suburban, and urban

setting. This simplified the recruiting process in Colorado and Virginia, where both pretesting and workshops were conducted during October.

Washington continued to have problems getting district cooperation, but scheduled the workshop for mid-November. Roads were bad and only thirteen teachers participated in the workshop (compared with thirty-four in Colorado, and thirty-six in Virginia). The tests were not printed in time for testing before the workshop, and in some cases were not administered until January.

Teacher Selection

Within each district there was to be another coordinator responsible for recruiting teachers as well as for distributing and collecting tests and other materials. Interested teachers agreed to participate regardless of the group to which they were assigned (workshop, materials, or control). This was done to assure that teachers in all groups were equally interested in wildlife education. This selection method seemed to be the most appropriate way to insure that field test teachers would be representative of teachers who may use Project WILD in the future.

However, voluntary participation in the project was not the case in all districts. In some areas of Virginia and Colorado, the local coordinators got the number of teachers requested by telling teachers they had to be part of the field testing. Some teachers felt coerced and were not certain why they were participating.

In Washington, the district representatives (some districts had none), took their task literally and made few attempts to fill the quota of teachers they were asked to recruit. Those teachers who chose to participate in this state were either very interested in the project or were convinced by other teachers that the materials would be useful in their classroooms. The result of this was that Washington had the smallest number of teachers participating in the posttesting (forty, compared to ninety-eight in Colorado and ninety-six from Virginia). In the end, Washington had only 17% of the total number of teachers involved in this study.

Testing

Pretests were given prior to workshop attendance or materials distribution in Colorado and Virginia. At this time, high school teachers decided with which class they would be most likely to use the Project WILD materials, and these students were designated for pretesting and posttesting. Teachers were free to use the materials with all of their classes, but only one class was tested.

Workshops

The three workshops were held in school settings, run by the same two facilitators, and followed the same schedule. Workshops in Colorado and Washington were conducted on Saturdays; in Virginia, on Friday, with the Division of Game and Inland Fisheries paying the substitute costs for the participating teachers. The effect of the Friday workshop on teachers' interest is discussed in the issues section.

Materials Distribution

In Colorado and Virginia, district coordinators were asked to distribute the Project WILD activity guide, an introductory letter, and an activity evaluation form to the teachers in the materials group. These teachers received the materials during the week following the workshop, and had the activity guides approximately the same length of time as the teachers who attended the workshop. In Washington, the materials were mailed or given to the teachers who were in the materials group during the months of November, December, or January.

EVALUATION DESIGN

Introduction

Changes in student learning and student attitudes were considered to be important outcomes of Project WILD. To assess these outcomes, cognitive and affective instruments were developed. These instruments were the bases for the quantitative segment of this evaluation, which sought to accurately measure the student learning and attitude changes that occurred as a result of exposure to the activities. The control group was established to provide a base line against which Project WILD students could be compared.

The qualitative segment, which included interviews, classroom observations, and surveys, was most useful in determining teacher opinions of the Project WILD implementation and materials. These techniques enabled the evaluator to understand specifically how teachers reacted to and used the materials. The qualitative methods provided information which gives a sense of the richness and detail of the project.

Instrument Development

The original plan was to develop four tests of student ability and attitudes based on the Project WILD materials. After an analysis of the secondary activities, however, it was found that there were only two activities not recommended for both groups. There was no need, then, for separate tests for the junior and senior high school students.

The two month process of instrument development proceeded from analyses of the curriculum framework at various grade levels, and of the activities specified for those grade levels. Hundreds of test questions were written from the framework and the activities and were reviewed many times by experts in measurement and wildlife education, including the Project WILD director. Following the review for face and content validity, and format and instrument problems, the instruments, each with one hundred to one hundred seventy items, were piloted with year-round school students in grades 2, 5, 6, 7, and 10. Item analysis aided in reducing the tests to the length that appears in the appendix (with forty-five items in the kindergarten through third grade test, fifty-six for the fourth through sixth grade test, and sixty-two for the seventh through twelfth grade test). The readabilities of the tests, calculated using the Fry Readability Formula, were as follows: primary test, 2.7 grade equivalent units; intermediate test, 4.5; and the secondary test, 5.5.

The test reliabilities for the students in the field test sample follow:

	Cognitive	Affective
Primary		
KR20	.72	.60
SBx2	.84	.75
Intermediate		
KR20	.70	.79
SBx2	.82	.88
Secondary		
KR20	.79	.85
SBx2	.88	.92

KR20 refers to Kuder-Richardson internal consistency method of determining reliability. The reader should note that with other things being equal, the longer a test, the greater the reliability. Because teachers could not be asked to give up more than two classes of instructional time, the tests were shorter than would be best for measurement purposes. Using the Spearman Brown prophecy formula to determine the reliabilities if the test

had been twice as long substantially increases the reliabilities of the tests (see the SBx2 values in the above chart). Nonetheless, the reliabilities which were obtained were more than adequate to make accurate assessments of student gains.

Tests appear in the appendix. A caution is made to anyone who might wish to use these tests. They were developed to reflect the entire group of activities and appropriate curriculum framework topics for each grade group and not as achievement tests for use by an individual teacher to see what the students in his or her classroom know about wildlife after participating in a few Project WILD activities. Unless the teacher did every activity with the students in the class, the teacher should select only those test items that reflect what was taught to students.

Testing Procedures

Although the primary test was designed to be read to those students, it was decided that non-readers and inexperienced test-takers would have too much difficulty, so kindergarten and first graders were excluded from taking this test. The evaluation of these students was done using qualitative methods. Second and third graders did take the test, read to them.

All students were given the pretests by someone other than their classroom teachers, to guard against teachers teaching to the test. Fourth through twelfth grade students were to read their tests themselves and then code their answers on a machine readable scoring sheet. In each state, however, a few administered the test to their own classes. Test scores from these classes were compared with other scores but no differences were found. In one Virginia and one Colorado district, some teachers were not consulted about which of their high school classes would be tested; testers arrived unannounced and tested inappropriate classes. When this condition was known within two weeks of the workshop, the appropriate classes were tested and the other data were disregarded.

A few minor problems occurred with the testing. Some students had difficulty with the format on the primary test and with the machine readable answer sheet . . . they coded more than one answer per item or could not follow the lines across the pages and thus had two or three responses per item and none for several others. Occasionally, incorrect tests were used with an age group (i.e. secondary students taking the test designed for intermediate students). In these cases, the data were not used in the analysis. Many tests and forms were miscoded, not coded, done in ink, returned on xerox versions, or answered on the test itself or on a separate piece of paper. In all cases possible, the evaluator corrected the test forms. Some teachers in Colorado and Washington had some of their classes for only one semester. This resulted in January testing in thirteen classes, and reduced the Project WILD exposure to between two and four months.

Posttests were distributed to the state and district coordinators in March for distribution by April and return by May. With two districts this still was not enough lead-time and tests were not distributed until after the May deadline for return. Teachers in these districts were out of school by the time the tests reached the evaluation office, so complete data were not retrievable, although some teachers were reached at their homes. In Washington, the individual teachers were asked to return the tests directly to the evaluation office, an inefficient process. Both of these factors, as well as teacher drop-out within other districts, increased the experiment mortality rate. Some teachers felt that they had too much to do at the end of the school year to give up a day for testing. All teachers who did not make the deadline were contacted by phone, but any tests returned after June 20 were not included in the analysis. Fortunately the total mortality rate was only 4%, not sufficient to bias results. Teachers administered their own posttests and returned those with a questionnaire we had requested them to complete.

Data Analyses

For this evaluation, data were analyzed using two parallel methods: analysis of variance (ANOVA) on gain scores and analysis of covariance (ANCOVA). Gain scores for all classes were computed by subtracting the pretest class means from the posttest means. These mean differences were then statistically compared using ANOVA procedures. Gain scores are easy to interpret and compare--they make sense. The ANCOVA method, on the other hand, is a more powerful and statistically sound procedure, but is not as understandable. Pretest means were used as the covariate and posttest means were the dependent variable, which meant that all classes were statistically adjusted such that their pretest means were similar.

Results using either method are always comparable. It is suggested that the teacher use gain scores when comparing classes but place more trust in the probabilities associated with the ANCOVA analysis. In no case in this evaluation were there any differences between the two procedures worth reporting.

Significance levels are reported for differences among means. If it is stated that the probability of a given difference is equal to .01 ($p = .01$), this means that the odds are at least one hundred to one ($.01 = 1/100$) that the observed discrepancies among the means reflect a true difference, one which can be generalized beyond the sample of teachers and classes in this study.

The unit of analysis for this evaluation was the classroom, not the individual student. Mean pretest and posttest scores of students were calculated for participating classrooms and these means were used to compute gain scores for each class. This

level of data aggregation is best for situations in which teachers are disseminating a new curriculum to students. The "treatment" (Project WILD activities) was administered similarly by one teacher to all students in a given classroom, hence comparisons of classrooms (teachers) was appropriate.

The teachers in the evaluation were not a random sample of all teachers. In most cases, these field test teachers were representative of teachers who were interested in wildlife education. This was especially true in Washington. It would be best to generalize findings of this study mainly to teachers who also show wildlife education interest.

Time and budgetary constraints dictated that only one cognitive and one affective test could be developed. The same instrument, then, was used for both pretesting and posttesting. It was possible for students to register gains from pretest to posttest simply because they remembered the answers to the pretest while taking the posttest. Using a control group, however, solved this problem. Gains among control group students were due to causes unrelated to Project WILD, such as remembering pretest answers, so that any gains in the Project WILD workshop or materials classes that were significantly greater than those of the control group can be safely attributed to Project WILD. The use of a control group allowed more certainty in interpreting the test results.

Gathering Qualitative Data

This portion of the evaluation required that the evaluator observe and talk with teachers using the materials. Considerable traveling was involved: the evaluator attended all three workshops, spent three weeks in Virginia, two weeks in Washington, and twelve weeks in Colorado interviewing more than one hundred teachers and a number of students and administrators at least once.

From the three state workshops, a total of twenty teachers was identified as "intensive teachers." These teachers were asked to keep detailed records of their use of and thoughts about the materials. They were interviewed often and observed as they taught their classes. Their students were also interviewed and the students' projects related to Project WILD materials were studied.

This method of evaluation also required painstaking record keeping, including transcribing taped interviews and typing field notes into readable form. All of these data were used to provide the quotations and vignettes which are part of this study, as well as to help illuminate the salient issues in the project.

The Effect of the Evaluation

In any evaluation, there is some intrusion by the evaluator into the lives of those studied. The process of evaluating requires that someone asks some questions of someone else about something. People know that the evaluation is taking place; this evaluation couldn't be kept secret. Particularly in the qualitative portion, teachers and their classes were asked to give up some of their time to talk about Project WILD. The intensive teachers knew they were a special part of the evaluation . . . that they were doing something that other teachers were not asked to do. There should certainly be some concern about the effect of all this attention on these educators. Fortunately, the intensive teachers were very similar to teachers in the total group. Of the twenty intensive teachers, two did not return posttest materials (10% mortality compared with 4% for the total group of field test teachers.) Their test gains were not very different from the mean gains for the entire group: cognitive gains, 1.96 for intensive teachers, 1.81 for others; affective gains, .073 for the intensive teachers, .071 for the others. It is possible that these teachers felt compelled to do more activities than they might have otherwise done, simply because they felt they should because they were such an important part of the evaluation. The intensive teachers averaged eight activities while the total group averaged 6.4. The number of activities done ranged from zero to nineteen, a range almost as varied as that of the total population of test teachers. It seems safe to say that the intensive teachers were similar to other teachers; data obtained from one group do not differ from that of the other group.

Another intrusion was the testing that was necessary for the quantitative portion of the evaluation. The pretest was particularly intrusive because testers other than the classroom teacher were required. Some bad feelings occurred, mostly toward the district coordinators who assigned testing times. These teachers did not seem to feel negatively toward Project WILD. Some were frustrated that their test class was not necessarily the class with which they chose to use the materials. Again, this was straightened out, but it did cause frustration at the time.

The instructional impact of the testing, which required two class periods (between thirty and forty-five minutes in most cases) for the administration of the pretest and posttest, is unmeasurable. Since they did not have access to the test, teachers could not teach to the test, but they could have done more activities than they might have done if they had not been part of the study, or they may have done a wildlife unit where they might not have otherwise done so. In some districts teachers were told to participate in the field testing. Although coercion might occur at any time, it is possible that more pressure was exerted on teachers during the field testing than would have been under normal conditions.

ISSUES AND RESULTS

Introduction

In this section, the six issues that seem most important in determining Project WILD effectiveness are discussed. The first four topics, grade group, teacher group, and state and area (rural, suburban, and urban) differences, were identified as important issues at the beginning of the study. In fact, the design was built around these topics.

During the evaluation, two other issues emerged as factors in teacher effectiveness: teacher interest and the subject area for which the teacher was responsible.

The major questions addressed are:

1. Is Project WILD more effective with elementary or secondary students? Does the project's success depend on grade level?
2. Is Project WILD more successful if teachers get materials through the mail or through a workshop?
3. Are there differences between teacher and student performance by state?
4. Is student success dependent on residence in rural, suburban, or urban areas?
5. Does teacher interest affect student learning or attitudes?
6. Was Project WILD used as an interdisciplinary curriculum? Did high school students in one subject area learn more than those in others?

Grade Group

The most significant finding in this study is differences in student performance across grade levels. Primary students gained most, followed by intermediate classes, then seventh through ninth grades, while tenth through twelfth grade students gained the least on both cognitive and affective measures (ANCOVA, $p = .001$; ANOVA, $p = .001$; see Tables 1 and 2).

Table 1

Posttest Means by Grade Group and Teacher Group Covarying on Pretest

ANCOVA: Cognitive

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance of F
Grade Group	142.476	3	47.492	14.364	.001
Teacher Group	27.221	2	13.610	4.117	.018
Interaction: Grade by Teacher	24.814	6	4.136	1.251	.282
Residual	681.093	206	3.306		

ANCOVA: Affective

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance of F
Grade Group	.576	3	.192	7.777	.001
Teacher Group	.085	2	.042	1.719	.182
Interaction: Grade by Teacher	.146	6	.024	.988	.434
Residual	5.082	206	.025		

Table 2

Gains by Grade Group

	Cognitive Mean Gains	Affective Mean Gains	Number of Classes
Primary (K - 3)	2.35	.18	48
Intermediate (4 - 6)	1.78	.15	71
Junior High (7 - 9)	.96	.00	58
Senior High (10 - 12)	.58	.01	42

ANOVA: Cognitive Gains

	Sum of Squares	Degrees of Freedom	Mean Square
Between Groups	145.349	3	48.4497
Within Groups	753.8302	215	3.5062

F = 13.8183 p = .001

ANOVA: Affective Gains

	Sum of Squares	Degrees of Freedom	Mean Square
Between Groups	.9378	3	.3126
Within Groups	5.3648	215	.0250

F = 12.5274 p = .001

Table 3

Percentage Breakdown by Grade Group Teachers' Responses

	K - 3	4 - 6	7 - 9	10 - 12	Total
1. Please rate your interest in teaching about wildlife and wildlife issues					
Very Interested = 5	40%	28%	18%	29%	29%
4	39%	48%	47%	29%	43%
3	13%	23%	26%	29%	22%
2	8%	None	6%	14%	5%
Not at all = 1 Interested	None	2%	4%	None	2%
2. Number of Activities Done 0	12%	23%	32%	26%	22%
1 - 4	16%	17%	26%	19%	19%
5 - 6	35%	15%	21%	30%	24%
7 - 11	21%	21%	16%	18%	29%
12 - 35	16%	25%	5%	7%	15%
Average Number of Activites Done	6.95	7.98	4.23	4.70	6.21
3. This year did you teach a specific unit about wildlife?					
YES	48%	47%	22%	20%	37%
NO	52%	53%	78%	80%	63%
4. I was easily able to integrate the Project WILD activities into my required curriculum					
AGREE	68%	62%	46%	50%	56%
NOT SURE	15%	19%	25%	25%	20%
DISAGREE	17%	19%	29%	25%	25%

Several factors might have contributed to this finding. Significant differences were found across grade groups when the gain scores were analyzed according to the teachers' ability to integrate Project WILD activities into their curricula (cognitive, $p = .08$; affective, not significant); previous use of environmental education materials (cognitive, $p = .001$; affective, $p = .02$); participation in a Project Learning Tree workshop (cognitive, $p = .02$; affective, $p = .04$); doing a specific unit about wildlife (cognitive, $p = .001$; affective, $p = .03$); and the number of activities done by teachers (cognitive, $p = .001$; affective, $p = .02$). Strong correlations exist between these variables and student test results. In other words, students did better on the cognitive and affective tests when their teachers had a background in environmental education, integrated the materials into their curricula, did a specific wildlife unit, took animal-related field trips, and did a lot of Project WILD activities. Elementary teachers fit this description much more often than secondary teachers.

Across grade groups, significant differences were found in teacher interest in wildlife education ($p = .05$), their ability to include Project WILD within their curricula ($p = .02$), their use of Project WILD activities in a wildlife teaching unit ($p = .001$), and the number of Project WILD activities done ($p = .02$). Table 3 reflects the percentage breakdown of the grade groups on these factors.

Elementary teachers were much more interested in teaching about wildlife than their secondary counterparts. Elementary teachers did more Project WILD activities as well as a wider variety of activities than the other teachers. Of the seventy-seven activities in the elementary guide, kindergarten through third grade teachers did sixty-one (79%); fourth through sixth grade teachers, 71 (92%). Of the eighty-three activities in the secondary guide, fifty-five (66%) were done by seventh through ninth grade teachers and only thirty-one (37%) by tenth through twelfth grade teachers.

Kindergarten through sixth grade teachers also taught about wildlife more often through units, and were better able to incorporate Project WILD into their curricula than were secondary teachers. Possible explanations are that the secondary teachers could find few activities to do, that the activity format was not as appealing to high school teachers as it was to elementary teachers, or that seventh through twelfth grade teachers found no way to mesh Project WILD with their assigned teaching topics.

Elementary teachers seemed quite comfortable with the activity format, but many teachers requested that teaching units be developed around topics of interest at their grade levels. Several teachers (both elementary and secondary) felt that individual student modules would be useful.

"I have kids who need a self-contained package for extra stimulation and others who need materials like this to reinforce concepts. Some nice, heavy cardboard, stand-up units for a learning center, maybe . ." (eighth grade teacher)

Another common request was for worksheets, charts or other student aids that might be included in the activity guide and duplicated by the teachers. A number of teachers developed their own student materials and sent them along with their evaluation instruments. Their imaginative handouts should be helpful in the development of the final version of the guides. Many also asked what was coming for use with computers.

Teachers of younger students were willing to use and adapt most of the activities that sounded interesting to them, and were very positive about their results.

"This activity ("What's Wild") was perfect for beginning our unit on wildlife. The class loved it. I varied it a little, or extended it. Instead of using pictures from magazines, I first had my class listen to "Gobble, Growl, Grunt" and had them identify some of the animal sounds; then I used the set of "Gobble, Growl, Grunt" animals I have. I passed them out and we continued the lesson from there. After classifying between wild and domestic, we classified by habitats and introduced this concept. Had a fun time." (first grade teacher)

Other teachers said:

"So many activities can be adapted to this grade level. Whether you recommend them or not, I am going to use them!" (first grade teacher)

"They were so excited about it! All three second grade classes I taught constantly checked out books on animals from the library!"

"They loved studying about bears ("What Bear Goes Where?") and they liked the art I integrated with various activities. They liked the outdoor ones best." (third grade teacher)

"They (students) grew in the respect that they have for animals, nature, and themselves." (second grade teacher)

"My students have become very verbal about wildlife issues. I'm pleased." (fifth grade teacher)

"I feel positive about the activities' usefulness . . . they work well with sixth graders."

"I used the activities for social studies, language development, and language experience. I know that this (Project WILD) will be a valuable resource and an important

part of my curriculum." (fourth through sixth grade special education teacher)

Secondary teachers were not nearly as effusive as the kindergarten through sixth grade teachers. Teachers who were comfortable doing activities with their classes and who incorporated the materials into their curriulum had the greatest success with Project WILD.

"Another bunch of good activities to choose from . . . wish I had time to do nothing but Project Learning Tree and Project WILD." (tenth through twelfth grade science teacher; class cognitive gain, 2.8)

"I did ten activities as written, took lots of ideas and developed my own activities around them. A lot of ideas were removed and stored for when I do those types of units." (junior high school science teacher; cognitive gain, 4.08)

A number of secondary teachers mentioned borrowing ideas (from the Project WILD guide) and not doing the activities as written.

". . . lectures and reading assignments work best with my students."

There was no consensus about how the materials work with high school students of varying abilities. A social studies teacher volunteered to participate in the field test so she "could use the materials with a low-level group of repeaters in a geography class" who needed something to motivate them. She and the students seemed to enjoy the activities. Part of a conversation with five students from that class follows.

"Sure, wildlife fits into geography . . . like migration of animals, like international stuff. That's a problem, isn't it?. . . We did an activity where we pretended we were bears ("How Many Bears Can Live in This Forest?"), and we had a den, a little piece of paper for a den, and we went around picking up little pieces of paper and they represented food . . . so you could discover land capacity, carrying capacity . . . It helped us cause we learned that the land can't hold as many animals or people as we might want. There's not enough food and other stuff to go around . . . Land capacity was one of our vocabulary words, too, and helped us learn it. We did one more activity, too . . . The bird one ("Adaptation Artistry") where she (the teacher) gave us a paper that had the kinds of beaks and wings for certain birds, like for what they did . . . Oh yeah, I remember that, it was an easy grade. All you had to do was draw . . . You invented your own bird . . . It was about adaptation . . . and so you had to pick an area and design the bird that would be best adapted to where he's going to live. We had a chapter on adaptation, that was a vocabulary word, too . . . It was

all right . . . It was fun and everybody in the class did it and turned it in . . . A lot of people in the class got it (the concept) better because we did it (the activity)."

But an eleventh grade social studies teacher said:
"I couldn't use any (activities). This low level class felt that they were too silly or immature! I would still like to use it (Project WILD) with a class of average or above ability (students). It would be great there."

Another group interview, this one with eleventh and twelfth graders from an advanced biology class, yielded the following comments.

"The activities aren't hard . . kind of in-between hard and easy . . . A lot of it is common sense . . .It's fun and something that a lot of people should know a lot more about . . . There's a lot of things we don't know about animals and wildlife, even though we live in the country . . . I'd like to learn more about how the animals survive, like through the winter; their diseases and things that kill them off and about their behavior . . . We don't know a lot about the animals of Virginia . . . just the ones you hunt for . . . and most of us don't even hunt . . . Deer, rabbits, squirrels, and turkeys, we know about . . . I'd like to know more about birds . . . Or how about reptiles and amphibians? . . . It would sure be nice to have films and slides and skins of the animals here in Virginia . . . and how about endangered species? Are there any activities about bald eagles, or whales? Like, how we can keep animals from becoming extinct? . . . There's a lot we could do if we knew more about it."

Evaluator, to four ninth grade biology students:
"How do you feel about the outdoor activities for high school students?"
Students:
"I like it. It's fun and educational . . . It's fun and learning put together . . . It's not like for elementary kids . . . back then you wouldn't have understood it (the concepts)".

A common concern secondary teachers expressed about the activity format was that their "students are just too mature for games."

"These students are on their way to college and I am responsible for helping them to get the highest SAT scores possible. They'd probably go along with one of these cutesy activities, but would definitely ask me how it was going to help them in college."

"My students are going to Princeton and Yale. I just can't give up class time to do fun stuff."

". . . the concepts are sound. Any chance of turning these games into computer simulations? High school students would probably be fighting to get to them." (ninth grade teacher)

Project WILD seemed to have an image problem for most of the high school teachers. It was not seen as supporting the high school curricula by the majority of those interviewed. The activities were seen as extras that did not correlate with the district objectives.

Both elementary and secondary teachers had concerns about using the materials to complement their curricula.

"I hope you are thinking about what's the best way to get materials integrated into the curricula . . I have no suggestions, but know that you need a good implementation strategy."

The process of coordinating the Project WILD activities with the district requirements and teacher objectives is a time-consuming one. Many teachers planned to spend part of their summer vacation going through the guide to determine which activities fit. Others, especially high school teachers, gave up without trying to find the interface between their subject area and Project WILD.

"This summer, I plan to remove the activities of interest to me (and at the appropriate level) as they fulfill the local district curriculum requirements. I also plan to share these materials and my work with other teachers at my grade level next school year." (second grade teacher)

"I was not able to incorporate as many activities into my curriculum as I had hoped. By having the Project WILD curriculum over the summer, I should be able to incorporate more activities next year." (7th grade, science)

"I didn't have sufficient time this year to study and incorporate the materials into the curriculum. I'm hoping to make better use of it next year." (ninth grade, social studies)

". . . impossible to fit into existing curriculum. The project looks good, but not accessible to the earth science teachers without eliminating already agreed-on curriculum. In other words, to add this (Project WILD) to the eighth grade science classes we would have to eliminate other areas."

"There is so much to cover in our social studies and science curriculum that I did not get to use it (Project WILD) much." (fourth grade teacher who did one activity)

The Project WILD materials, as written, work with elementary students. Kindergarten through sixth grade teachers were used to doing activities with their students and were able to use the Project WILD activities to affect students' knowledge and attitudes.

With high school students, the cognitive and affective gains were slight. Teachers did not use the materials nearly as often as elementary teachers, and had difficulty with the activity format. They also had trouble seeing the materials as anything but extras. As one tenth through twelfth grade science teacher said:

> **"We all need more direct information linking specific activities with specific curriculum areas. With curriculum guides and course objectives being stressed more and more these days, learning techniques such as used in Project WILD need to demonstrate their relevance to curriculum topics."**

For the most part, the substance of the secondary Project WILD guide seems fine, but the presentation might be changed to a format that is more useful to secondary teachers. (NOTE: This was done in a revision before final printing of the first edition of Project WILD.) They need to be able to pick up the guide and see how it will help them teach what they are required to teach.

Teacher Group

The teachers in this study were divided into three groups; those who received the Project WILD activity guide during a six-hour workshop (workshop group), those who received the materials with no explanation (materials group), and those who received no materials (control group). The control group was necessary to determine if the changes between the pretest and posttest were due to Project WILD or to other alternatives, like student maturation or awareness of wildlife through national news stories.

In both ANCOVA and ANOVA analyses (see Tables 1 and 4), the classes of teachers with the Project WILD materials (both workshop and materials groups) did significantly better on the cognitive test than classes of teachers in the control group. No significant differences were found among the groups on the affective measure, although the workshop and materials groups showed gains slightly larger than the control group. Affective gain scores always showed the same pattern as cognitive gains, but were never as significant, an indication that attitudes are more resistant to change.

Table 4

Gains by Teacher Group

	Cognitive Mean Gains	Affective Mean Gains	Number of Classes
Workshop	1.7888	.0740	65
Materials	1.8508	.0727	77
Control	1.0925	.0317	77

ANOVA: Cognitive Gains

	Sum of Squares	Degrees of Freedom	Mean Square
Between Groups	26.7363	2	13.3681
Within Groups	872.4429	216	4.0391

F = 3.3097 p = .04

ANOVA: Affective Gains

	Sum of Squares	Degrees of Freedom	Mean Square
Between Groups	.0865	2	.0433
Within Groups	6.2160	216	.0288

F = 1.5037 p = .22

The reader can see from these data that there were virtually no differences between the cognitive and affective gains of classes based on how the teachers got the Project WILD materials. The gain scores of the classes of materials and workshop teachers differed little.

Materials and workshop teachers did not differ significantly on the number of activities they did. Materials teachers averaged 6.8 activities, workshop teachers, 5.5. There were also no differences between their Project Learning Tree workshop experience, previous use of environmental education materials, or wildlife interest. These four factors, however, were important indicators of gains. Significant gains were recorded by the students of teachers who had attended Project Learning Tree workshops (cognitive, p = .03; affective, not significant), who had previously used environmental education materials in their classes (cognitive, p = .001; affective, p = .02), who were interested in teaching about wildlife (cognitive, p = .05; affective, p = .01), and who did a large number of Project WILD activities (cognitive, p = .001; affective, p = .01). Regardless of how the teachers got the materials, those teachers with more experience with environmental education materials and greater interest in wildlife education had greater gains in their classrooms.

Table 5 records this data. As an example to aid the reader in his or her interpretation, 18% of the materials teachers did between twelve and thirty-five activities. Their students gained an average of 2.69 points between the cognitive pretest and posttest, and .19 points on the affective portions.

No relationships were found between the number of hours teachers had taken in environmental education and related topics, and their students' gain scores. (Materials and workshop teachers averaged ten and nine hours, respectively.)

The data suggest that student learning had little to do with whether teachers attended a Project WILD workshop. As long as a teacher had an activities guide, his or her students experienced gains. These gains were correlated with a teacher's experience with and interest in environmental education, but no distinction could be made between classes of teachers who attended a workshop and those of teachers who only received the materials.

From the ANCOVA table (Table 1), the reader can see there was no interaction between teacher group and grade group. The effect of grade grouping was similar within each teacher group. However, the breakdown in Table 6 illuminates the grade levels for which the workshop was most beneficial in terms of cognitive gain scores.

Table 5

Mean Gains and Percentage Breakdowns of Workshop and Materials Teachers' Responses

	Workshop Group			Materials Group			Total		
	Cognitive Gains	Affective Gains	%	Cognitive Gains	Affective Gains	%	Cognitive Gains	Affective Gains	%
1. Project Learning Tree Workshop Attendance									
YES	3.03	.11	18%	2.33	.11	10%	2.75	.11	14%
NO	1.49	.07	82%	1.75	.07	90%	1.63	.07	86%
2. Previous Use of Environmental Education Materials									
YES	2.34	.07	59%	2.37	.14	53%	2.36	.10	56%
NO	.97	.08	41%	1.11	-.01	47%	1.05	.03	44%
3. Interest in Teaching about Wildlife and Wildlife Issues									
Very Interested = 5	2.47	.13	33%	2.40	.15	25%	2.44	.14	29%
4	1.79	.08	43%	2.20	.09	42%	2.00	.09	43%
3	.60	.02	22%	1.51	.05	23%	1.11	.04	22%
2	3.19	-.48	2%	1.19	.00	7%	1.53	-.08	5%
Not at all = 1 Interested	No Teachers			-.75	-.07	3%	-.75	-.07	2%
4. Number of Project WILD Activities Done									
0	-.11	.03	20%	1.29	.02	24%	.65	.02	22%
1 - 4	.53	.03	23%	1.69	.09	16%	1.09	.06	19%
5 - 6	2.48	.11	26%	1.47	.01	23%	1.93	.05	24%
7 - 11	3.88	.06	19%	2.19	.08	19%	2.97	.07	19%
12 - 35	3.19	.20	11%	2.69	.19	18%	2.87	.20	15%

Table 6

Gain Scores by Grade Level by Teacher Group

	Cognitive Change	Affective Change	Number of Classes
Kindergarten through Third			
Workshop	4.23	.20	10
Materials	2.84	.20	19
Control	2.14	.14	19
Fourth through Sixth			
Workshop	2.21	.08	22
Materials	2.01	.09	26
Control	1.11	−.02	23
Seventh through Ninth			
Workshop	.79	.03	18
Materials	1.49	−.02	21
Control	.53	.00	19
Tenth through Twelfth			
Workshop	.75	.04	15
Materials	.45	−.02	11
Control	.50	.02	16

The cognitive gains of the students of the workshop teachers at the primary level is by far the largest: the average gain in the ten primary workshop classes was almost 1.5 points greater than the average of classes with materials only (significant difference, $p = .01$). Other cognitive differences were not statistically significant. Students in the fourth through sixth grade workshop and materials groups had attitudes more consistent with Project WILD objectives in the posttest. These attitudes were significantly different from fourth through sixth grade control groups ($p = .025$). Affective changes for other grade groups showed a similar pattern, but were not statistically significant.

Many of the comments of the primary teachers indicated the importance of the workshop in establishing interest in and confidence about the Project WILD materials.

> **"The workshop was quite useful. The activities that were seen were easier to do with my class."** (first grade teacher)

> **"It (the workshop) was great! I feel that I am more informed about various aspects of wildlife and I can expose my students to more things about wildlife now."** (kindergarten teacher)

"I'm so glad the project exists. It is a real positive comment for our future. I'm most delighted to be involved in such an important project." (third grade teacher)

"I enjoyed the activities we did. They were fun, but they also had an objective to learn. That is an unbeatable combination and so important for my students." (third grade teacher)

"I've gotten motivated again and excited to try something new." (third grade teacher)

"Because I teach first grade, I am always looking for non-reading activities. I think these are great and am very anxious to try them."

"What we did is great, but I need even more . . . a presentation about animals to educate me more. I just don't know as much about them (animals) as second graders want to learn."

"I needed the workshop. I am not strong enough (in content) to even teach my students about animals!" (first grade teacher)

There was basically no difference between the gains of fourth through sixth grade students based on whether their teachers attended a workshop or were materials teachers. The following comments indicate the variety of opinions about the workshop among intermediate teachers:

"Best workshop I have attended in twelve years of elementary teaching." (fourth grade teacher)

"I was impressed with the activities at the workshop and continue to be so as I work my way through the guide." (sixth grade teacher)

"Many of the activities (done at the workshop) were difficult to implement or not particularly interesting to my students. My time would have been better spent reading the manual." (fourth grade teacher)

Seventh through ninth grade materials classes gained more on the cognitive posttest than did their cohorts in the workshop or control groups. Materials teachers seemed indifferent about their need to attend a workshop. Most teachers in the workshop group felt the workshop was okay. But shortly after the workshop, one teacher was excited enough to say:

"It is so very interesting and wonderful that all areas of the language arts can be integrated, not just science!"

Many tenth through twelfth grade teachers found the workshop to be relaxing and beneficial.

> **"I did not learn anything about content, but it was nice to be around so many people with interests like mine."** (tenth grade teacher, science)

When pressed for details, many agreed that attending the workshop helped them to get an idea of what the activities were like. The gain scores of the workshop classes were slightly better than were those of the materials group.

Primary teachers seemed to get the most benefit from the workshop--benefit in terms of confidence and enthusiasm, especially. Teachers of other grade levels expressed a range of opinions about the workshop. Workshops were useful for primary teachers, and for other teachers who did not have the environmental education background or confidence necessary to use the materials.

Tables 7 and 8 show that teachers who attended the workshop had an easier time integrating the Project WILD materials into their required curricula (p = .04) and more often used Project WILD activities to teach basic skills (p = .002) than did the materials teachers. Teachers who were able to include Project WILD as part of their curricula, and also teach basic skills using the materials, did more activities than teachers who did not achieve this integration. The pilot workshop helped bridge the gap between Project WILD activities and the established curricula, but still may not have had enough emphasis on this important educational concern.

Table 7

Number of Activities Done by Teacher Response

	Strongly Agree 5	4	3	2	Strongly Disagree 1
I was easily able to integrate Project WILD into my required curriculum. (p = .001)	9.70	8.76	6.52	3.29	.64
The Project WILD activities were an effective way to teach basic skills while at the same time teaching wildlife-related concepts. (p = .04)	10.73	7.22	6.74	3.85	.75

Table 8

Percentage Breakdown of Workshop and Materials Teachers' Responses

	Strongly Agree 5	4	3	2	Strongly Disagree 1
I was easily able to integrate Project WILD into my required curriculum.					
Workshop Teachers (%)	22.4	41.9	11.3	12.9	9.7
Materials Teachers (%)	7.8	37.5	28.1	14.1	12.5
The Project WILD activities were an effective way to teach basic skills while at the same time teaching wildlife-related concepts.					
Workshop Teachers (%)	14.5	51.6	25.8	6.5	1.6
Materials Teachers (%)	3.3	39.3	37.7	14.8	4.9

Not surprisingly, teachers' ability to integrate activities into their curriculum and to teach basic skills using Project WILD is strongly related to their interest in teaching wildlife education (integration, $p = .001$; basic skills, $p = .001$)

An important emphasis of workshops, particularly for high school teachers, is to use Project WILD to illustrate or strengthen concepts that are already a part of the teacher's curriculum. If these materials are to be supplementary, then teachers need to know how Project WILD can supplement what the teachers are expected to teach their students. This might be done verbally during workshops and in writing in the final version of the guides.

Teachers who attended the workshop felt much more strongly that workshops should be required than did the materials teachers ($p = .007$). However, when the materials teachers were asked: **"Do you think attending a workshop would have helped you to implement the activities better?"**, 73% said **yes**, 17% said **no**, and 10% said **not sure** ($p = .01$).

"I would have preferred to have gone to a workshop. That way I might have spent some time on the activities and found a spot for a little teaching."

The more activities teachers did, the less necessary they felt it was to have a required workshop, although this was not a particularly strong difference ($p = .19$). Because the number of activities done is strongly related to teachers' prior experiences, this finding is not so surprising.

On the final questionnaire, teachers responded to four questions about the usefulness of the workshop. Seventy-one percent of the teachers agreed that the workshop was useful in helping them to implement Project WILD activities, 11% weren't sure, and 10% disagreed. A similar question about the workshop providing appropriate strategies to do the activities yielded the following responses: 75% agreed, 17% were not sure, and 8% disagreed. At the workshop, resource materials were provided by the state wildlife agency, the American Humane Association, Defenders of Wildlife, National Audubon Society, and the National Wildlife Federation. Seventy-six percent of the workshop teachers felt the resource materials were useful in Project WILD implementation; 14% were not sure; 10% disagreed.

The classes of both groups of teachers who had Project WILD guides did significantly better than the classes of teachers who did not. Student learning and attitudes about wildlife were positively affected by Project WILD. While the method by which a teacher received the activity guide made little difference in the cognitive gain of his or her students, it did make a difference in the teacher's level of confidence in using the materials. Attending workshops may not have produced any greater cognitive gains than simply receiving the materials, except in the case of the primary teachers, yet many teachers found the workshops to be valuable. Primary students benefited most if their teachers attended a workshop. The teachers of these students gained confidence in their ability to use Project WILD activities, and the students achieved greater cognitive gain than did students of teachers who did not attend a workshop.

State Differences

Significant differences were found among states on cognitive gain scores ($p = .03$), affective gain scores ($p = .06$), and the ANCOVA analysis of both cognitive and affective posttest results ($p = .01$). In particular, the gains of classes in Washington exceeded those in Colorado and Virginia (see Table 9).

Table 9

Gains by State

	Cognitive Mean Gains	Affective Mean Gains	Number of Classes
Colorado	1.7199	.0683	92
Virginia	1.1580	.0292	88
Washington	2.1223	.1026	39

As detailed in the introduction, state coordinators experienced different obstacles in trying to implement the field test. Washington showed great gains because the small group of teachers were very motivated, but not as many students were exposed to Project WILD as in the other states. The enthusiasm and recruiting success of the coordinators in Colorado and Virginia led to greater numbers of teachers being involved than in Washington. Said a seventh grade teacher who had not used environmental education materials before:

> "_____(district coordinator) was so excited after hearing about Project WILD (from the state coordinator) that she got me excited about it. I had been optimistic even before the workshop. I realized that the Project WILD materials would be very useful when trying to plan feasible activities in life sciences."

It makes sense that the wider the implementation, the less familiar the participating teachers will be with environmental education materials and using activities in their curricula. Virginia, then, the state that showed the smallest student gains, had the largest number of participants and included teachers with the least experience with environmental education. This is probably attributable to differences in implementation of the project, including providing release time for the workshop, and the ability of the state coordinator to encourage teachers to participate. The net effect of this situation is that Project WILD affected a large number of students in Virginia, but that many of these students did not learn as much because of their teachers' inexperience with incorporating environmental education into their curricula. The data in Table 10 illustrate this idea.

Table 10

Teacher Background and Experience by State

	Colorado	Virginia	Washington
Average number of Project WILD activities done during field testing (p=.01)	5.23	5.88	9.50
Average number of college credit in Ecological Science, Environmental Education Methods/ Materials, and Environmental Issues and Sciences (p=.005)	10.61	4.95	12.05
Percentage who had used environmental education materials within their classroom prior to Project WILD (p=.001)	57%	40%	73%
Percentage who had participated in a Project Learning Tree Workshop (p=.80)	13%	14%	21%

Teachers in the three states differed significantly according to the number of Project WILD activities they did, the number of environmental education hours they had taken, and by the percentage having environmental education materials available and using them in their classrooms in other school years. States differed only slightly according to the number of teachers who had taken a Project Learning Tree workshop.

Teachers with a predisposition to activity-oriented lessons did better with the materials than other teachers. Virginia teachers seem not to have had as much experience with college environment-related coursework or environmental education materials, and may need more time or encouragement to get used to the activity approach. Most of the Washington teachers were already incorporating environmental education materials into their lessons before getting the Project WILD materials. These differences may be responsible for the significant differences in gain scores among the three states.

As a result of variations in implementation strategies, participating teachers in the three states in which Project WILD was field tested showed clear differences in environmental education experience and interest. These differences, it would appear, were responsible for the discrepancies in gain scores which occurred across states. It may be possible, however, that other factors, such as the demography of the region or the amount of time between pretesting and posttesting (some Washington teachers pretested in January; some Colorado classes posttested in January), were also involved in state-to-state variations in student learning and attitudes. Questions of this nature, however, were beyond the scope of this study. Nonetheless, there was persuasive evidence that a state's implementation plan exerted considerable influence on the kind of teacher who became involved in Project WILD and therefore affected student gains. If states choose a broad implementation plan, they should not expect gains like those seen in Washington. These large gain scores were not based on large numbers. Teachers' background and experience may be the best predictor of how Project WILD will work.

Rural, Suburban, Urban Differences

No significant differences were found between the cognitive or the affective gain scores of students in rural, suburban and urban areas, although mean gain scores for these groups show that on both instruments, urban gains slightly exceeded suburban and rural gains (see Table 11).

Project WILD was equally effective in all three settings; neither student learning nor student attitudes changed from area to area.

The environmental education background and experience of teachers differed across settings. Teachers who participated in

the field testing also d ffered somewhat as to whether they had participated in Project Learning Tree workshops, but not significantly when analyzed by the area in which they teach. 19% of the urban teachers had attended Project Learning Tree workshops at some time, compared to 8% of the suburban teachers and 17% of the rural teachers. Similarly, when teachers were asked if they had used environmental education materials in their classrooms, differences were found. 60% of the urban teachers, 52% of the suburban and 49% of the rural teachers answered yes. The number of credit hours the teachers had taken in ecological sciences (including wildlife ecology and management), environmental education materials and methods, and environmental issues and sciences, was significantly different across the three areas. The mean number of credits reported for urban teachers was 11.7. Suburban and rural teachers had taken 8.9 and 5.8 credit hours, respectively. Clearly, urban teachers have the most familiarity with environmental education. The small advantage in cognitive and affective gain scores which urban classes showed may be attributable to their background in environmental education.

During field testing, rural teachers averaged 5.3 Project WILD activities in their classrooms, compared with 6.4 for suburban, and 7.0 for urban teachers ($p = .09$). Again, the environmental education background of urban teachers may facilitate their usage of Project WILD.

Table 11

Gains, Number of Activities Done, and Field Trips Conducted by Area

	Cognitive Mean Gains	Affective Mean Gains	Number of Activities	Number of Field Trips
Urban	1.8649	.0696	7.04	.98
Suburban	1.4293	.0607	6.40	.59
Rural	1.4162	.0473	5.28	.59

Although not reported elsewhere, average scores on the posttest, when analyzed across area and grade group, are reported here. They help illustrate that regardless of area, students performed about the same on the cognitive and affective posttest. When examining these data, the reader should keep in mind that different tests were administered to primary, intermediate and secondary students. The primary test had twenty-one cognitive items; the intermediate, twenty-five; and the secondary, twenty-seven. On the affective tests, the lower scores indicate attitudes more consistent with Project WILD goals. In other words, the suburban kindergarten through third grade affective mean of 1.59 on the posttest more closely reflects attitudes of the Project WILD activities and framework than do the means of the students in rural and urban areas.

Table 12

Posttest Mean Scores by Grade Group for Classes with Project WILD Materials

	Rural	Suburban	Urban
Kindergarten through Third			
Affective	1.75	1.59	1.74
Cognitive	14.26	15.86	14.35
Fourth through Sixth			
Affective	1.55	1.56	1.64
Cognitive	13.78	13.78	13.28
Seventh through Ninth			
Affective	1.71	1.39	1.58
Cognitive	10.97	13.66	13.07
Tenth through Twelfth			
Affective	1.40	1.57	1.64
Cognitive	15.02	13.32	13.25

Suburban teachers seemed most overwhelmed by the number of extras they felt they had to squeeze into their curricula and by the amount of supplementary materials available. This may account for the number of activities they did. One suburban first grade teacher said:

> **"There's so much to do. We had computer literacy pushed on us this year . . . with first graders. There's lots of pressure to get them into college, you know. They write programs, follow the directions, and run it all themselves."**

Urban teachers averaged double the number of field trips of classes in other areas. Several urban schools were near parks, but students in these areas were not permitted to use them.

> **"We can't go outside unless we get there on a bus. It's not safe, I guess."**

Many rural and suburban schools had land labs, nature trails, and natural areas outside their doors, and the freedom to use them. A rural high school science teacher commented:

> **"I love this binder (**of Project WILD activities). **If it's a nice day, I write a note on my board and have all my classes meet at the amphitheater** (approximately three minutes on the nature trail from the high school). **We do a few activities and have a ball."**

Although urban teachers had more background and familiarity with environmental education and their classes showed somewhat greater gains in learning and attitudes, these differences in gain scores were not very different from the gains recorded in rural and suburban settings. In all three areas, Project WILD was effective.

Teacher Interest

Teachers were asked to rate their interest in wildlife education. Significant results were found when comparing the teachers' ratings with the cognitive and affective gains of their students (cognitive, $p = .02$; affective, $p = .01$). Although not statistically significant ($p = .16$), the number of activities teachers did based on these ratings indicated the same trend (see Tables 13 and 14).

Table 13

Mean Gains Based on Teacher Interest in Teaching about Wildlife

	Very Interested 5	4	3	2	Not at all Interested 1
Cognitive Gains	2.21	1.68	1.05	.92	-.33
Affective Gains	.12	.06	.02	-.02	-.06

Table 14

Average Number of Activities Done Based on Teacher Interest in Teaching about Wildlife

	Very Interested 5	4	3	2	Not at all Interested 1
Number of Activities Done	7.19	6.64	5.33	2.14	0.00

As noted in the state section, the Virginia workshop was held on a school day, with substitute pay being donated by the Virginia Commission of Game and Inland Fisheries. Of the Virginia teachers interviewed, only four mentioned having the day off as a reason for volunteering to test the Project WILD materials, but these teachers did very few activities (zero to two activities each). If monies are available for substitutes, teacher time reimbursement, or credits, perhaps this should not be announced until after the teacher registers for the workshop. While the motivation for teacher participation could not be directly assessed, evidence seems to indicate that the level of interest of the teacher has a great deal to do with how many activities the teacher chooses to do, and with what and how much the students learn.

Significant differences were found in the cognitive gain scores of students among the fourteen participating districts (see Table 15).

Table 15

ANOVA: Cognitive Gains By District

	Sum of Squares	Degrees of Freedom	Mean Square
Between Group	106.3217	13	8.1786
Within Group	792.8575	205	3.8676
F = 2.1146	p = .01		

These results indicated that student learning varied considerably among districts. Since teachers were recruited differently from district to district, it was possible that teachers' motivation to participate in Project WILD was the crucial element in district differences. To test this supposition, student learning in districts where teachers were coerced or assigned with which classes to use the materials were compared with student learning in other districts.

Many teachers in three districts mentioned during their interviews or on their questionnaires that the decision to be a part of the evaluation was not made by them. Comments like the following were heard or read often.

"I like the program, but did not feel committed to pilot as I did not volunteer . . . the materials just arrived."

"_____(the district coordinator) said the workshop was ____ (date) and that we had to be there."

In two districts, teachers were assigned testing times based on the schedule of the pretest administrators. As one high school social studies teacher said:

> **"I was assigned a class in which to use the materials based on when the test could be administered. This does not encourage the best use of the materials."**

Many teachers in these districts expressed similar views.

The mean cognitive gain for those districts in which some teachers were coerced was .7583; and for those assigned testing times and classes, .6494. Mean gains in the other districts averaged 2.0412. The average number of activities done in the districts also corresponds to the teachers' reason for participating in Project WILD: coerced, 4.53 activities done; assigned, 4.12; and in other districts, 9.54 activities done. These data suggest that coercion had a deleterious effect on the teachers' enthusiasm for the project as well as reducing student learning.

The field test version of Project WILD was without page numbers and the useful appendices that now appear in the final version. Even so, few workshop teachers had problems using the materials as they were.

> **"It (the workshop) helped me build interest in doing this as something worthwhile, not just one more thing to do. It sure helped me understand how it was organized and should be used."**

Materials teachers had more difficulty understanding the format and struggled with the huge volume of activities.

> **"I am a member of Audubon and _____(city) Field Ornithologists and very committed to wildlife, but even for a committed teacher, I feel the format must be made more clear or it is going to sit on the shelf."**

> **"I've worn out my thumb trying to find things--and my patience. What I need is probably there, but I can't find it. Can't you separate the primary and intermediate activities to make it easier--and lighter?"**

A high school special education teacher, given the secondary guide wrote:

> **"I feel that my participation in this program, while being needed and useful to you, is quite impossible for just one person to figure out. I am far too busy to spend my time in a project with no direct application to the educational needs of my students."**

A follow-up phone call confirmed that the elementary guide would have been more useful to meet the need he had for hands-on activities and was at such a level that his students could comprehend what they were doing. He was quite relieved to know that the final version of the materials would include a topic index and cross references. He felt the elementary guide (which will be sent to him) **"could be of interest and beneficial to this group of students."**

Many teachers took the time to work through the activity guide to develop a correlation between Project WILD and their curriculum. Others expressed interest in having someone coordinate Project WILD with the district objectives or in having specific wildlife units developed that would simplify the task for them. Said a kindergarten teacher who attended the workshop:

"Dear Project WILD -
I am sorry that I only did one activity!
I plan on going through the resource book this summer and using more activities next year!
I feel if the materials were organized into units that I would use them more!
Thanks!
P.S. Animal dittos would be helpful!"

Implications are that teachers should not receive the materials when they have not requested them, be talked into going to a workshop they do not care about, or be told to do the activities in classes where the teachers don't think they fit. The materials are much less likely to be used. Teachers who are interested in wildlife do more activities and their students learn more than other students. This interest might be increased if more teachers can see how Project WILD will fit into their curricula.

Subject Areas

Science was the subject into which most elementary teachers incorporated Project WILD activities. Eighty-three percent (83%) most often used the materials in science classes; 10% with social studies; 3% with language arts; and 1% with math, reading, and creative writing. In response to the request to list other subjects in which they used the activities, teachers most often listed: language arts, 35%; followed by art, 20%; social studies, 15%; mathematics, 11%; reading 9%; outdoor education camp, 7%; creative writing, 4%; and physical education, handwriting, spelling and vocabulary development, 2%.

At the high school level, the majority of teachers taught science (72%); 13% taught social studies; 9% language arts; 2% environmental education classes, industrial arts, and special education; and 1% physical education. While the difference in cognitive gain score means was not quite significant at the .10 level ($p = .12$), the gains for language arts classes are much

greater than those of science and social studies classes with Project WILD materials. Because of the small numbers of classes, the other subject areas are not reported and were not considered in this analysis. As the reader can see from Table 16, there were virtually no differences in affective gains in all high school subject areas.

Table 16

Gains and Number of Activities Done by High School Subject Area

	Cognitive Mean Gain	Affective Mean Gain	Number of Activities	Number of Classes
Science	.9096	-.0104	5.24	52
Social Studies	1.0467	.0189	2.78	7
Language Arts	2.2471	.0043	3.57	9

So, while Project WILD was used mostly in science classes and to teach science, more spectacular gains occurred in the language arts and communications area at the high school level.

> **"Project WILD seemed to have just the right activities whenever I was stuck and needed something to strengthen a skill."** (tenth grade, language arts teacher)

Not all science teachers found the materials useful. In fact, no earth or physical science teachers did any activities. Two teachers, who were from a district where coercion was common, wrote the following letter at the end of the project:

> **"We are sure your materials would be valuable to teachers who include such topics in their planning. We are puzzled about your motivation in choosing us, physical science and earth science teachers, as participants in your experimental project. We are sorry we were not able to use the activities, many of which seem to be excellent for appropriate curriculum areas."**

Another wrote:

> **"As an earth science teacher, I did not feel that I could use these wildlife materials in my curriculum. In our system, units of astronomy, geology, meteorology, paleontology, plate tectonics, and oceanography are taught to eighth grade students.**
>
> **"As a department chairman, I saw the value of the materials and worked with another teacher and our school administration to implement a new semester elective for the 1983-84 school year. The course was opened to seventh and eighth grade students amd approximately ninety signed up for it. "Wildlife, the Environment, and You" will be taught next year and your curriculum materials will be used extensively**

along with materials from the Virginia Game and Inland Fisheries."

Earth and physical science-related activities should be identified within the guide or developed it if seems important to appeal to teachers of these subject areas.

Teachers of elementary students, as well as high school teachers of science and social studies, agreed with the statement: **"I was easily able to integrate the Project WILD activities into my required curriculum."** Language arts teachers disagreed. Across all subject areas, the most popular use of the materials was on a one-at-a-time basis, incorporated into the existing curriculum, instead of combining Project WILD activities into units of study.

Other issues related to subject area concerned the timing of receiving materials and the lack of correspondence with district objectives or texts. Selected comments follow:

"We did not use much of the material because of time limitations and lack of correlation to our basic science/ social studies texts."

"Personally, I wasn't able to do as much as I would have liked, due to the way our objectives are set up in _____ Public Schools. The materials are excellent. I don't think justice can be done unless schools can institute it as a separate course."

"I did not use materials as I had already covered any material that would have been suitable before I received the guide. Could use in the fall of the year for Colorado geography and wildlife."

If Project WILD is going to have its broadest use in all subject areas, teachers who teach skills need to know that the activities can help to reinforce what they are teaching. Stressing language and mathematics skills when advertising the project seems important. For the teachers of science and social studies, the planned topic index will be useful. The index should include titles common to science and social studies texts. Working with curriculum coordinators to link the activities with objectives and texts will also encourage teachers to make Project WILD part of their instructional repertoire. Most teachers will probably not have the luxury of (or interest in) teaching a semester-long class about wildlife, although several teachers felt a wildlife course was the best way to teach the Project WILD curriculum. Many teachers mentioned that getting the materials earlier would have been more useful than waiting until after school was under way. Planning around teachers' schedules is a difficult task at best. There was no agreement among the interviewed teachers about the best time to offer a workshop.

VIGNETTES

Introduction

The short stories that follow are not fiction. The teachers are real participants in this field test of Project WILD. Their names and any other identifying characteristics have been changed.

Vignette 1

When you walk into Nancy Weber's classroom, you are not sure what to look at first. Every square inch of space is covered by some bright and interesting work. Nineteen third-grade-size, butcher-paper bodies, with some of the innards glued on, line the east side of the room. Collages of domestic and wild animals cover the south wall. Here and there, food chain mobiles hang from the ceiling. A 3-D zoo for "Polar Bears in Phoenix" sits on the art table and surrounding floor. The alphabet peeks out from under posters in the front of the classroom. Books are everywhere.

> Nancy volunteered to participate in the field test . . . **"because I am always looking for something new. I just can't keep doing the same thing over and over again, year after year."**

And she . . .

> **"loved the workshop. I got many fine ideas from the activities we did and excited about the manual, too. In fact, I spent most of Sunday** (the day after the workshop) **reading it. I went through every single activity to find the ones that get into our objectives for science, social studies, and even for math."**

In one of the activities she did, the students, sitting in their assigned life groupings, were trying to develop a mural and report on the mammals that could be found in their areas. The grassland group was trying to find out if all buffaloes were extinct, and if not, where they lived. After pouring through a few books, they were excited to tell the forest group that not only were buffaloes alive and well, but that there were forest buffaloes and grassland buffaloes. The students studying deserts were trying to get the proportions of their Bactrian camel just right. They assured me that "a **bunch of wild camels, not ever domesticated, live in the Gobi desert."** The next stage of this activity was to make a bar graph, showing the relative number of animals that could be found in their environments. Their teacher selected "Graphananimal" and adapted it because,

"it was quite compatible with our science unit on life zones and their animals. Graphing is also one of the math objectives for third graders."

Mrs. Weber, an urban teacher, did nineteen Project WILD activities with her class. Their cognitive gain from pretest to posttest was almost six points; their affective gain was .29 (an above average gain on both portions of the primary test). Most of the activities she did were chosen because they fit within the district's objectives and her own objectives for these students. She often adapted activities to these objectives and, for the most part, proceeded from the beginning to the end of the guide doing the activities.

Nancy's description of their final unit:

"I incorporated the lesson plan "Can Do" as a culmination to our litter study ("Litter We Know"). The students invited members of student council to visit their (our) classroom and their collages. (Rather than have students bring bags of littered items we went on the playground and in thirty minutes had thirty-six pounds of assorted litter. We weighed them in the nurse's office.) The student council members were quite impressed and took several of our litter collages to the various classrooms. As a result, each classroom now has the responsibility to clean up litter on the school grounds on a rotating basis."

Vignette 2

The following is taken verbatim from an interview with a materials teacher.

"I feel that the resource guide is excellent. I had no problem at all following the lessons as written--and they fit into my curriculum beautifully. Because I teach environment in the fourth grade science curriculum, I used it to teach adaptation, environmental factors concepts, conservation activities and as part of an energy unit with the Berkeley materials. I used it in language arts and for art activities, and had one period, a Tuesday afternoon period that wasn't specified for science or social studies or anything really, which I used strictly for creative activities . . . like activities that worked on self-concept . . . and Project WILD fit into that perfectly.

"I'm really organized, so I went through the whole book first of all. I wanted to read the whole book, but that was impossible, so I looked at the sections, the seven sections, and zeroed in on what those concepts were. Like the attitudes one at the end and the middle sections that were more on diversity, adaptation, survival of the fittest and those kinds of things--things that I teach in the elementary form. I just looked at the titles and if I saw a title that sounded like a creative activity, if it sounded catchy or whatever, I would look it up. I wanted to do three or four activities in each section, and skimmed the interesting-sounding ones to find three entirely different activities. I was always looking for ones that were outdoors and then an alternative in case it snowed or rained.

"We went outdoors a lot, but if it was impossible, we would do one of the poster making activities or something like that. In fact, I have a plot of land that is in its natural state over here that I can use. _____(utility company) lets me use it. It has organisms and plants. It's kind of a montane transitional zone. It's got some grasses and anthills so I use that often. We also have a prairie dog colony that's about a block away. There were a lot of activities (in Project WILD) where you go out and write in your journal and keep track of the same spot, keeping track of the increases and decreases in plants and animals. We used the prairie dog area lots for that. And I also made sure I met the man over there who owns the ditch. He lets us go along there to do some water study. And there's a pond about two blocks away that we can use whenever we want.

"Most of my elementary students looked forward to Project WILD. For these students, Project WILD meant going outdoors, but they also got interested in wildlife in books because of it. Some of their attitudes changed. They would tell me about a wildlife show they watched on TV and tell me what

they learned. They became more observant when we went out. I also taped the Life on Earth series and made up worksheets for them to go along with the programs as we watched them in class. They got really interested through that, too.

"I teach two sections of science. My science class received Project WILD and the other one didn't because I have less time for the other class (the administration had scheduled half an hour longer for science for one group of students). So in teaching the same concepts I was kind of enriching with Project WILD. And everything I was teaching along the science objectives could be enriched with Project WILD. Compared to the other class, I noticed that my class had a good grasp on what an environment was and what an environmental effect was (like if the environment changed too suddenly that an animal would become extinct), what extinction was, what adaptation and protective coloration are and all these main ecological concepts that Project WILD is trying to teach. They could talk about it more than the other class. We did some soil study and they got really involved in that and noticed some of the conservation practices that farmers use . . . the harvesting of the corn, the monoculture that exists around here.

"Most of these students are quite affluent: they go camping and hunting and fishing a lot. There's a lot of interest here. They talk about the deer, fish, and bighorn sheep. A lot of their parents are photographers. If we take a field trip, I might send a note home asking for binoculars to study birds. At least half of the students will show up with them. Parents want to come along on our field trips . . . like to Pawnee National Grasslands, the heron rookery, the environmental education center and even to the prairie dog colony.

"I love teaching environmental studies. I have twenty hours past a masters in environmental studies. Although most of the science teachers go to higher levels (they don't stay in elementary), I try to do as much as I can with all the students in this building to get science into the elementary curriculum. I just keep seeing less science being taught in the elementary schools. Project WILD is so much better than the SCIIS kits we use because it's more project-oriented. I found Project WILD to have activities that you could read at night and get the ideas and then do it your own way--to turn it into a project, extend it or have some individualized instruction. In other words, you can have small groups working on projects more than you can with that packaged science stuff. I think teachers need that to supplement the science curriculum, which in this district is basically a SCIIS kit. No textbook, just the kit, movies and filmstrips. And no activities outdoors.

"Project WILD would be especially useful in language enrichment and language arts or any kind of creative activity that you wanted to do. I've kept a bulletin board free for Project WILD and I put up drawings and posters, and collages --whatever we are doing. A lot of students that never got involved with anything artistic are drawing. They always have the option with our creative language activities to write prose, or to make a list of observations, to write poetry, or draw.

"Project WILD is great. I can't wait to get the final version with page numbers. Besides, my other copy is just about worn out."

Ida Shaw did fifteen activities with her fourth graders. Their cognitive gain, 4 points; affective gain, .98 points.

Vignette 3

The Project WILD test administrator arrived during third period to give the pretest to Chuck Carlin's advanced biology students. Chuck was not pleased. The assistant superintendent of the school district had told him he had to participate in the field testing of this new curriculum and his agreement was reluctant, at best. He was so involved with extra-curricular student activities this year that he wondered if he would have time to plan anything new for the biology classes into which Project WILD might fit. Chuck crossed his fingers, hoping that he would be in the control group. Now this person was at his door to test the wrong class. At the workshop, Chuck said nothing about his preference to try the materials with his regular biology students. The workshop . . .

> **"was not too useful. There wasn't anything presented that I felt really fit in with my advanced biology curriculum."**

Chuck did two activities with his students . . .

> **"because when I say I am going to do something I at least give it a shot. They thought the one where you sit on everybody's lap was a hoot ("Habitat Lap Sit"). The other one was better. The deer one where you make a graph at the end. At least that had a concept to it ("Oh Deer!")."**

The secondary cross references arrived in January, but Chuck did not have time to look at them.

> **"This is an extra and I just do not have the time to figure out how this stuff could fit into a year that is already too full."**

Chuck's class actually lost almost one point from pretest to posttest on the cognitive test (loss = .83). On the affective test his students showed a .19 loss, a shift away from attitudes consistent with Project WILD.

SUMMARY AND RECOMMENDATIONS

Project WILD had a definite impact on students and teachers. Students showed significant gains in learning and developed attitudes toward wildlife that were consistent with Project WILD goals. Teachers found the activities stimulating and worthwhile in their classes, and were able to integrate them into their curricula.

The effects of the project, however, were not uniform. Secondary teachers tended to struggle with the activity format and did fewer activities with their classes. Cognitive gains were minimal at the junior and senior high school level, and there were no changes at all in student attitudes. Elementary teachers, on the other hand, had much more success with the activities. These teachers had more positive attitudes toward the project and their classes showed large gains in learning and positive changes in attitudes.

Teachers participating in Project WILD who had more interest and background in environmental education showed greater facility in implementing the project. They did more activities, were more enthusiastic, and their students had greater cognitive and affective gains. These teachers seemed to feel more confident in their ability to use the activities, and more comfortable with the project. Teachers who were coerced to participate, often teachers who had little knowledge of environmental education methods, did not experience much success.

As might be expected, Project WILD was most often used to teach science. This was true at both elementary and secondary levels. The materials, however, were not useful to teachers of some subject areas, including the physical and earth sciences. Particularly at the secondary level, language arts and social studies teachers did significantly fewer activities with their students. The language arts classes, though, showed the greatest cognitive gains of any subject area.

Differences in how teachers were selected and how the project was coordinated produced variations in outcomes among the three states. The state that had the most interested teachers showed the greatest student gains, but reached the fewest students. The state with the largest group of teachers, many of whom had little interest or background in environmental education, showed the smallest gains, yet nearly three times as many students were involved. Is it better to have three hundred students who gain three points each on the cognitive test, or nine hundred students who gain one point?

Project WILD was implemented in three settings within each state: rural, suburban, and urban. Although urban classes registered somewhat larger gains, the differences among these

groups were not significant. Classes showed gains in urban, suburban, and rural areas. The project can be generalized to any of these settings.

Surprisingly, in terms of student gains and the number of activities done, it made little difference whether a participating teacher had attended a workshop or received the materials with no instruction, except in the case of primary teachers. Classes of both teacher groups showed significant cognitive and affective gains when compared with the control group. Attending a workshop did make a difference in teachers' attitudes and confidence about Project WILD, particularly at the elementary level. Primary-level teachers felt strongly that the workshop provided useful instruction and information about the activities, and their students' cognitive achievement reflected the importance of the workshop. For the most part, secondary teachers saw little value in attending a workshop.

The following recommendations are based on the data gathered during the evaluation:

1. The secondary activity format should be revised. Secondary teachers and students experienced only limited success with the project. It would be wise to interview junior and senior high school teachers to determine a format that would be more useful for them before any further dissemination of Project WILD at this level. (NOTE: Based on these findings, the secondary activity format was revised before the first printing of the Project WILD materials.)

2. Some flexibility should be allowed in the proposed workshop requirements. Teachers with experience with Project Learning Tree, environmental education materials and methods, and with doing supplemental activities in their classes should not be required to attend a workshop to get the materials. Many teachers found the workshops valuable as a source of information; workshops should be made available for these teachers.

3. Teacher participation in Project WILD should be voluntary. Teachers who felt strong pressure to attend the workshop had almost no success with the project. They did few, if any, activities, and their classes did not benefit. This was also true when teachers were coerced into using the materials.

4. Teachers from all demographic settings should have access to Project WILD materials and workshops. There is no reason to believe that the kind of community a student lives in will affect his or her response to wildlife education.

5. If Project WILD seeks to be truly interdisciplinary, more work needs to be done to encourage incorporation of the activities into subjects other than the life sciences. Stressing language and mathematics skills when advertising the project seems important. For teachers of the science and social studies, the planned topic index will be useful. The index should include titles common to science and social studies texts. Working with curriculum coordinators to link the activities with objectives and texts will also encourage teachers to make Project WILD part of their instructional repertoire.

6. Workshops and the final version of the materials should stress how Project WILD can supplement required curricula. An important emphasis of workshops, particularly for high school teachers, should be to use Project WILD to illustrate or strengthen concepts that are already a part of the teacher's curriculum. Many teachers benefited from knowing how to integrate Project WILD into their units and from being able to strengthen basic skills while teaching a wildlife activity.

APPENDIX

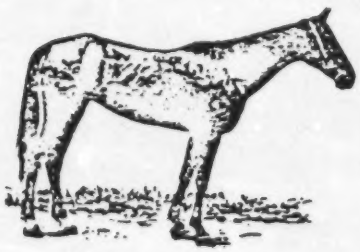
DIRECTIONS

In front of you is a set of questions about wildlife. I will read each question out loud while you follow along on your own. After I read each question, you will have time to think about the best answer and mark it down on your own set of questions. You will not know all the answers, but please do the best you can. Also, this will not be a part of your grade in this class. Please put your name on the top of this page.

Answer the first six questions by circling "Y" if you think the answer is yes, "N" if you think the answer is no, and "?" if you are not sure.

		Yes	I don't know	No
1.	Could animals live without plants?	Y	?	N
2.	Do animals and people have the same basic needs to survive?	Y	?	N
3.	Do all animals need a home?	Y	?	N
4.	Are all wildlife habitats the same?	Y	?	N
5.	Do domestic animals have habitats?	Y	?	N
6.	Do most animals like being crowded together?	Y	?	N

7. Put an X on each animal. There might be more than one animal.

a. 

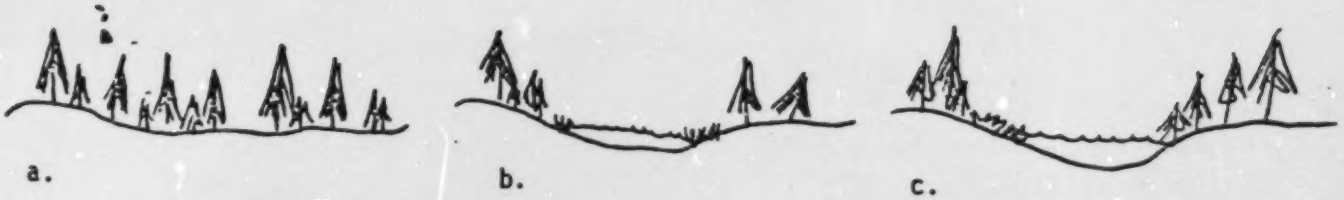
b.

c.

d.

c. 1982, Western Regional Environmental Education Council: K - 3 Test

8. Here are pictures of some stages an area that was once a lake has gone through. Which picture shows the last stage? Put an X on that picture.

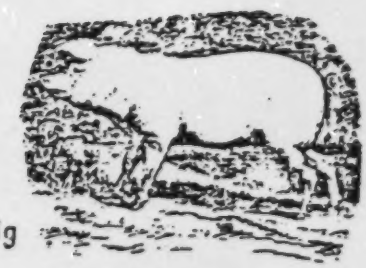


a. b. c.

9. Pick out the domestic animal from the pictures. Put an X on the domestic animal.

a. fly

b. seal



c. pig

d. squid

For the next seven questions, circle the letter in front of the best answer.

10. Which group of animals lists only animals that are wild?
    a. cow, lion, skunk
    b. dog, horse, kitten
    c. dog, kitten, lion
    d. deer, fox, skunk

11. If an animal breathes faster and its heart beats faster, the animal is probably
    a. cold
    b. sleeping
    c. frightened

12. All polar bears are white. They live in areas where there is ice and snow. Polar bears probably are white because
    a. white makes them look pretty to other polar bears
    b. white fur is warmer than any other fur color
    c. white fur makes polar bears harder to see so they can sneak up on seals and other prey

13. The combination of food, water, shelter and space in a suitable arrangement is called
    a. habitat
    b. adaptation
    c. food chain
    d. niche

14. Which of these clothing materials does not come from animals?
    a. wool
    b. cotton
    c. down
    d. fur

15. Which of these lists is a food chain?
    a. grass → flower → tree
    b. grass → rabbit → fox
    c. cat → dog → person
    d. elephant → zebra → deer

16. What would happen to animals that eat plants if all the plants died?
    a. They would be okay because they could eat other animals.
    b. They would die.
    c. They would get along better than before.

Questions 17 to 21

Animals have special adaptations which help them live better. Some adaptations help animals keep enemies away, some adaptation help animals attract mates and some adaptations help animals to get food. For each animal, put an X below the best reason for the animals' adaptation.

	to keep enemies away	to attract a mate	to be better at getting food
17. Baby deer (fawns) are born with spots.			
18. Many birds have brightly colored feathers.			
19. Lions and tigers can run fast.			
20. Some toads and frogs smell bad.			
21. Turtles have hard shells.			

DIRECTIONS: For the next 24 sentences, circle "Y" for Yes if you agree, circle "N" for No if you disagree, or circle "?" if you are not sure.

Example:	Yes	I don't Know	No
I would like to go fishing	Y	?	(N)

This means this student would not like to go fishing.

1.	Poisonous snakes and insects that could hurt people should be killed.	Y	?	N
2.	I know the names of many plants and animals where I live.	Y	?	N
3.	Spiders are important animals.	Y	?	N
4.	Forest fires should always be put out.	Y	?	N
5.	If a herd of deer is too large and many of the deer are starving, it is all right to kill some.	Y	?	N
6.	I am very interested in wild animals.	Y	?	N
7.	I would like there to be more kinds of wildlife living around my home and school.	Y	?	N
8.	I would like to do more to help our wildlife.	Y	?	N
9.	Wildlife is valuable.	Y	?	N
10.	I would like to learn more about animals.	Y	?	N
11.	I think other people should know more about wildlife.	Y	?	N
12.	If I found a healthy fawn (baby deer) in the forest, I would try to take it to a place where people could take good care of it.	Y	?	N
13.	I think all rats and cockroaches should be killed.	Y	?	N
14.	Hunting and fishing should be outlawed.	Y	?	N
15.	People should share the world with wildlife.	Y	?	N
16.	We should be able to use wildlife as we wish.	Y	?	N
17.	I like reading books about wild animals.	Y	?	N
18.	Wolves are bad animals.	Y	?	N
19.	I want to be a hunter when I grow up.	Y	?	N
20.	Dangerous animals like grizzly bears should be shot.	Y	?	N
21.	More people should have wild animals as pets.	Y	?	N
22.	There are plenty of places in the world for wildlife to live.	Y	?	N
23.	Wild animals cause a lot of problems for people.	Y	?	N
24.	I would like a job working with animals when I grow up.	Y	?	N

DIRECTIONS

This is a test of your knowledge of wildlife. Please do the best you can to answer the questions correctly, since this will help us provide better wildlife education programs for you and other students. We will not use the results as part of your grade. Please put your name on the answer sheet. Mark in the spaces that correspond with the letters of your name. DO NOT WRITE ON THIS TEST.

The first four questions are either true or false, so please mark "A" if you think the statement is correct and "B" if you think it is wrong. If you are not sure, mark "C" (I don't know).

Example: Animals could live without plants. T F

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

This means the student thinks the statement is false.

1. Littering harms wildlife more than habitat destruction harms wildlife.

2. If all mosquitos were killed, other wildlife would be affected.

3. Predator species are not affected by pesticides.

4. All endangered, threatened and rare species can be saved if we spend enough money for research and management.

c. 1982, Western Regional Environmental Education Council: 4 - 6 Test

DIRECTIONS

The next 13 questions are multiple choice. Please read the question and mark the letter on the answer sheet which shows the answer that you think is best.

Example: If an animal breathes faster and its heart beats faster, the animal is probably

Ⓐ Ⓑ ✱ Ⓓ Ⓔ

a. cold
b. sleeping
c. frightened

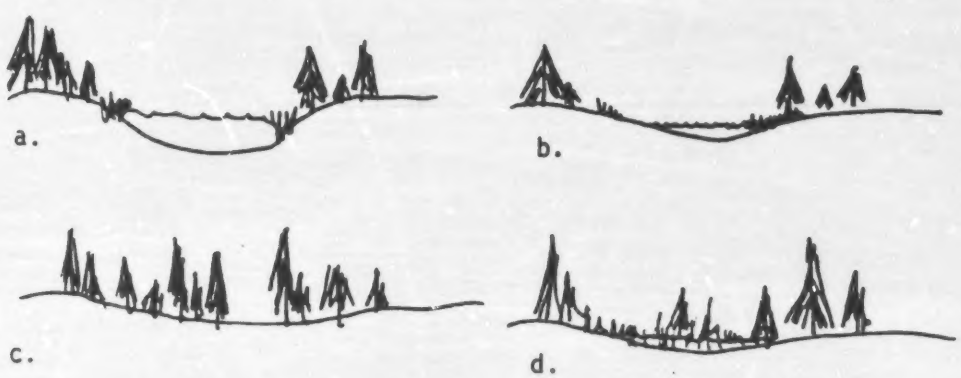
The student thinks "C" is the correct answer.

5. Which of the following animals would most likely be caught by a predator?
   a. a brightly colored animal
   b. a fast running animal
   c. an animal that stands perfectly still
   d. an animal that eats at night

6. Which list of animals could be best combined to make a food chain?
   a. grass, bushes, trees
   b. people, cows, horses
   c. eagles, grass, rabbits
   d. pigs, cows, chickens

7. In Alaska more people keep moving into grizzly bear habitat. As more people move into these areas, what will happen to the number of grizzly bears?
   a. There will be more grizzly bears.
   b. There will be fewer grizzly bears.
   c. The number of grizzly bears will not change.
   d. There is no way to predict what will happen.

8. Here are pictures of some stages an area that was once a lake has gone through. Which picture shows the last stage?



9. In a mountain valley a balance exists between the number of coyotes and the number of rabbits. Suddenly all the coyotes disappear.
   a. Every year the number of rabbits will keep getting larger.
   b. The number of rabbits will not change.
   c. The number of rabbits will increase, but only for a few years.
   d. Most of the rabbits will die right away.

10. When a non-native wildlife species is introduced into an area, it usually
   a. hurts all native species
   b. helps all native species
   c. hurts some native species but helps some others
   d. has no effect on native species

11. The most common reason for animal extinction in the modern world is
   a. habitat loss
   b. competition with other animals
   c. hunting
   d. pollution
   e. predation

12. An animal species which could disappear forever is called
   a. threatened
   b. rare
   c. extinct
   d. endangered
   e. abundant

13. There are many pigeons in towns and cities. Why is this so?
   a. Pigeons have adapted better than most other wildlife to towns and cities.
   b. Predators have killed most other wildlife in cities.
   c. Competitors have filled up the pigeons' niche.
   d. Pigeons have always been in cities.

14. In Brazil, forests are being cleared so that more crops may be grown. Because of this, what is likely to happen?
   a. Some wildlife will move but there will be little overall effect on the number and type of animals.
   b. There will he fewer kinds of animals after a while.
   c. No change at all will happen in the number and types of animals.
   d. More kinds of animals will live there than do now.

15. Which of the following is not part of a crocodile's habitat?
   a. water
   b. fish
   c. sunlight
   d. the crocodile's age
   e. other crocodiles

16. If there were no light for several years, which of the following things would die?
    a. snakes
    b. birds
    c. weeds
    d. butterflies
    e. all would die

17. The yucca plant and yucca moth have a relationship of mutualism. If all the moths were to die, which of the following results would be most likely?
    a. There would be more yucca plants.
    b. Most yucca plants would eventually die.
    c. Yucca plants would not be affected.
    d. Yucca plants would grow larger.

QUESTIONS 18 to 21

Here are some things which may change how many deer there are in an area. Tell which of the following will probably cause more deer during the next three years, which things will cause fewer deer in the next three years, and which probably won't change the number of deer. For each statement, mark "A" on the answer sheet if the action will cause more deer; mark "B" if the action will cause fewer deer, and mark "C" if the action will cause no change.

		Cause More Deer	Cause Fewer Deer	No Change
18.	Building a shopping center	A	B	C
19.	The number of birds has increased	A	B	C
20.	Other animals that like the same foods have been brought into the area	A	B	C
21.	Much of their habitat has been flooded and is now a lake	A	B	C

QUESTIONS 22 to 25

Elaine keeps rabbits in a large cage in her backyard. Her rabbits often have babies. Three months ago there were four rabbits. Now there are twenty (20). Twenty is the right number of rabbits for the size of the cage. If Elaine takes good care of the rabbits and keeps their cage clean for the next year, mark "A" on the answer sheet to show which of the following things probably will happen and mark "B" to show which probably will not happen.

		This will happen	This will not happen
22.	The rabbits will continue to have babies. Most of the babies will live, and there will be hundreds of babies after one year.	A	B
23.	The rabbits will keep having babies, but many will die because there won't be enough space in the cage.	A	B
24.	More babies will survive than usual because there will be lots of adult rabbits to take care of them.	A	B
25.	The stronger rabbits may get more food and the weaker rabbits will die.	A	B

DIRECTIONS

You should respond to the next statements by marking the letter that best agrees with your feelings. You have five choices:

A = Strongly Agree
B = Agree
C = I'm not sure
D = Disagree
E = Strongly Disagree

Example: All clothing should be made of natural materials. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

This student does not think all clothing should be made of natural materials.

26. Poisonous snakes and insects that could hurt people should be killed.
27. I know the names of many plants and animals where I live.
28. Spiders are important animals.
29. Forest fires should always be put out.
30. If a herd of deer is too large and many of the deer are starving, it is all right to kill some.
31. I am very interested in wild animals.
32. Wildlife is valuable.
33. I would like to learn more about animals.
34. I think other people should know more about wildlife.
35. If I found a healthy fawn (baby deer) in the forest, I would try to take it to a place where people could take good care of it.
36. I think all rats and cockroaches should be killed.
37. Hunting and fishing should be outlawed.
38. People should share the world with wildlife.
39. Wildlife belongs to people.
40. We should be able to use wildlife as we wish.
41. I like reading books about wild animals.
42. I like to watch birds just for fun.
43. I think that if people pay for a hunting or a fishing license, they should be able to hunt or fish anywhere they please.

44. Insect sprays should be used so that we can have fruits and vegetables without worms.
45. Ranchers should kill an eagle if it attacks their sheep.
46. We must try to preserve and protect all endangered plant and animal species, regardless of the cost.
47. Wildlife is only valuable if people can use it.
48. I feel responsible for what happens to wildlife.
49. Non-game species are just as valuable as game species.
50. What other countries do with their wildlife is none of our business.
51. Throughout the world, wildlife do not have enough space to live.
52. We should always kill snakes that are close to our homes.
53. There are plenty of places in the world for wildlife to live.
54. Wild animals cause a lot of problems for people.
55. Helping wildlife is one of the most important things people can do.
56. I would like a job working with animals when I grow up.

DIRECTIONS

This is a test of your knowledge of wildlife. Please do the best you can to answer the questions correctly, since this will help us provide better wildlife education programs for you and other students. We will not use the results as part of your grade. Please put your name on the answer sheet. Mark in the spaces that correspond with the letters of your name. DO NOT WRITE ON THIS TEST.

The first four questions are either true or false, so please mark "A" if you think the statement is correct and "B" if you think it is wrong. If you are not sure, mark "C" (I don't know).

Example: Animals could live without plants. T F

This means the student thinks the statement is false.

1. Carrying capacity of an area may change from season to season.

2. Sport hunting has been more responsible than commercial hunting for some wildlife extinctions.

3. Wildlife habitat loss is a worldwide problem.

4. All endangered, threatened and rare species can be saved if we spend enough money for research and management.

c. 1982, Western Regional Environmental Council: 7 - 12 Test

DIRECTIONS

The next 17 questions are multiple choice. Please read the question and mark the letter on the answer sheet which shows the answer that you think is best.

Example: If an animal breathes faster and its heart beats faster, the animal is probably

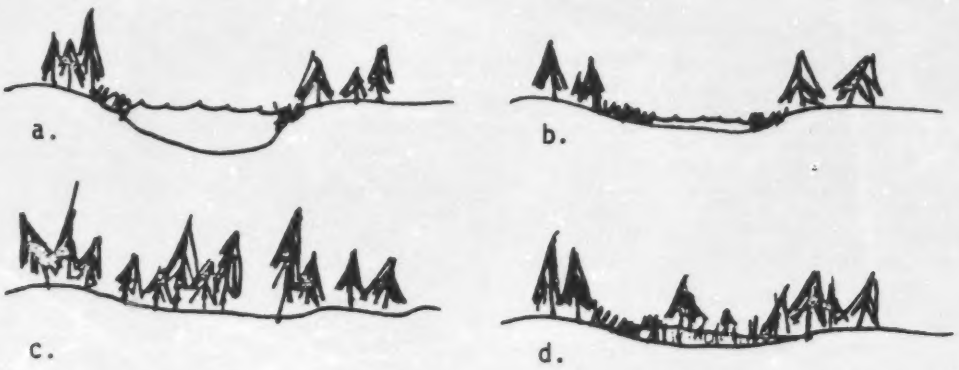
Ⓐ Ⓑ ● Ⓓ Ⓔ

a. cold
b. sleeping
c. frightened

The student thinks "C" is the correct answer.

5. Making a stream a lot warmer (at least 10 degrees) is
   a. helpful to all plants and animals in the stream
   b. helpful to some plants and animals in the stream and harmful to others
   c. harmful to all plants and animals in the stream
   d. harmful to the plants but helpful to the animals

6. Here are pictures of some stages an area that was once a lake has gone through. Which picture shows the last stage?



7. Spraying crops and trees with chemical insect poisons increases crop yields and protects the world's food supply. Nevertheless, many people insist the use of insect poisons should be prohibited. Why do these people oppose the use of insect poisons?
   a. The number of insects usually increases after each spraying.
   b. Only insects are affected, and other pests are not.
   c. The cost of spraying is greater than the savings in food.
   d. Poisons accumulate in food chains.

8. Which animal species is endangered?
   a. deer
   b. bald eagles
   c. buffaloes
   d. sharks
   e. golden eagles

9. Which of these is not a usual characteristic of an endangered species?
   a. high economic value
   b. eat only one kind or a small variety of foods
   c. not tolerant of human presence
   d. live only in a limited area
   e. high reproductive rate

10. If a new Ice Age were to occur on the earth, wildlife would most likely be affected in which of the following ways?
   a. All would become extinct.
   b. Only arctic species would survive.
   c. All cold blooded animals would die.
   d. Those which adapted would survive.

11. Which of the following statements is most accurate?
   a. Wildlife is becoming extinct at a much faster rate now than it was 500 years ago.
   b. The rate of extinction has not changed much in the last 500 years.
   c. The rate of extinction was greater 500 years ago than it is now.
   d. No animals became extinct until about 500 years ago.

12. Which characteristics of pesticides like DDT makes it most harmful?
   a. It rarely controls the pests it was supposed to control.
   b. It causes high death rates among meat eating animals.
   c. It lowers the resistance of certain insects to other poisons.
   d. It must be used in large quantities to kill the pests.

13. The kea is a native bird of New Zealand which once lived almost entirely on native fruits. Sheep were introduced to the island and the kea added sheep to its diet. The kea changed from:
   a. an herbivore to a carnivore
   b. an herbivore to an omnivore
   c. an omnivore to a carnivore
   d. an carnivore to an omnivore

14. The number of organisms of a species that can survive in a given area is called
   a. arrangement
   b. niche
   c. habitat
   d. carrying capacity

15. Which of the following is not part of a crocodile's habitat
   a. the crocodile's age
   b. sunlight
   c. other crocodiles
   d. water
   e. fish

16. Unless disturbed by humans, a natural population over several years will tend to
   a. get smaller every year
   b. get larger every year
   c. some years be larger and some years be smaller
   d. become extinct

17. Which of the following is the truest arrangement in a food chain?
    a. carnivore → herbivore → omnivore
    b. carnivore → omnivore → herbivore
    c. omnivore → carnivore → herbivore
    d. herbivore → omnivore → carnivore
    e. none would occur in nature

18. Sharks have existed for millions of years while some other species of fish have become extinct. The best reason for this is
    a. Humans have killed most of the extinct fish species but have not been able to kill all the sharks.
    b. Sharks have killed most of the extinct species.
    c. Sharks were better adapted to their environment.
    d. Sharks live in an environment that has not changed for millions of years.

19. A meadow has about 1,000 mice living in it. Conditions have not changed much in the last 10 years, so it has had about the same number of mice during that time. About 50,000 mice were produced this year. How many mice will the meadow probably have next summer?
    a. none
    b. about 100
    c. about 1,000
    d. about 50,000

20. In many cases wildlife management has been successful with wildlife populations. Wildlife management has been unsuccessful in
    a. bringing back extinct species
    b. preventing other species from becoming endangered
    c. reintroducing animals that had become extinct in a small area
    d. protecting threatened species

21. Most animal species are being reduced or are disappearing from areas because of
    a. predation
    b. hunting
    c. infectious diseases
    d. habitat destruction
    e. inability to adapt to changing climate

The next three items are based on the following information:

The eyes of a deer are sometimes parasitized by eye-flies. Assume these flies live only in the eyes of deer. The deer's principal food is blueberry bushes. In one region, Oriental beetles that feed only on eye-flies were introduced.

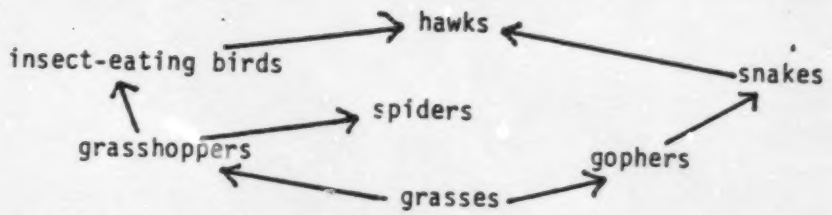
22. The introduction of the beetles is an example of
    a. biological control
    b. pesticide control
    c. genetic control

23. If the beetles thrive, there will probably be
    a. an increase in the deer population
    b. an increase in the blueberry population
    c. an increase in the eye-fly population

24. After the beetles kill all the flies in the region, what would you predict would then occur?
    a. The beetle population will go up.
    b. The deer population will go down.
    c. The blueberry population will go down.

25. Which of the following things is most important for a healthy wildlife population?
    a. good habitat
    b. large breeding population
    c. human help
    d. no predators

26. The pine beetle is an insect which lives by burrowing under the bark of pine trees. Eventually the trees die. This is an example of
    a. parasitism
    b. commensalism
    c. mutualism
    d. none of these



Base the next answer on the relationships shown above.

27. If all the hawks were removed, what would probably happen?
    a. The birds would leave the area.
    b. The grasshopper density would get larger.
    c. The spider density would get larger.
    d. The snake population would get smaller.
    e. The gopher population would get smaller.

DIRECTIONS

You should respond to the next statements by marking the letter that best agrees with your feelings. You have five choices:

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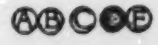
B = Agree
C = I'm not sure
D = Disagree
E = Strongly Disagree

Example: All clothing should be made of natural materials. 

This student does not think all clothing should be made of natural materials.

28. Poisonous snakes and insects that could hurt people should be killed.
29. I know the names of many plants and animals where I live.
30. Spiders are important animals.
31. Forest fires should always be put out.
32. We should kill all coyotes to protect lambs and calves.
33. I am very interested in wild animals.
34. I would like there to be more kinds of wildlife living around my home and school.
35. I would like to do more to help our wildlife.
36. Wildlife is valuable.
37. I would like to learn more about animals.
38. I think other people should know more about wildlife.
39. If I found a healthy fawn (baby deer) in the forest, I would try to take it to a place where people could take good care of it.
40. I think all rats and cockroaches should be killed.
41. Hunting and fishing should be outlawed.
42. People should share the world with wildlife.
43. Wildlife belongs to people.
44. We should be able to use wildlife as we wish.
45. I like watching T.V. shows about wild animals.
46. I sometimes watch spiders just for fun.
47. It is okay to hunt and kill animals to keep them from starving.
48. I think that if people pay for a hunting or a fishing license, they should be able to hunt or fish anywhere they please.

49. Insect sprays should be used so that we can have fruits and vegetables without worms.
50. Wildlife is only valuable if people can use it.
51. I feel responsible for what happens to wildlife.
52. Watching birds as a hobby would be a waste of time for me.
53. I would like a career in a wildlife related field.
54. Non-game species are just as valuable as game species.
55. What other countries do with their wildlife is none of our business.
56. Throughout the world, wildlife do not have enough space to live.
57. It is okay to kill whales as long as they are used for food.
58. Usually the number of birds killed in an oil spill is justified by the need for more energy.
59. Some wilderness areas should be preserved from development no matter how much money it costs.
60. If I had the opportunity I would get involved in an issue that affects wildlife.
61. I think the best way I can help wildlife is to be involved in public or political decisions that affect wildlife.
62. It really isn't my responsibility to take care of wildlife. We have scientists, wildlife managers and other people to do that.

COGNITIVE ITEM KEY

K - 3 Test	4 - 6 Test	7 - 12 Test
1. n	1. f	1. t
2. y	2. t	2. f
3. y	3. f	3. t
4. n	4. f	4. f
5. y	5. a	5. b
6. n	6. c	6. c
7. a,b,c	7. b	7. d
8. a	8. c	8. b
9. c	9. c	9. e
10. d	10. c	10. d
11. c	11. a	11. a
12. c	12. d	12. b
13. a	13. a	13. b
14. b	14. b	14. d
15. b	15. d	15. a
16. b	16. e	16. c
17. a	17. b	17. d
18. b	18. b	18. c
19. c	19. c	19. c
20. a	20. b	20. a
21. a	21. b	21. d
	22. b	22. a
	23. a	23. a
	24. b	24. c
	25. a	25. a
		26. a
		27. e

AFFECTIVE ITEM POLARITY

K - 3 Test	4 - 6 Test	7 - 12 Test
1. -	26. -	28. -
2. +	27. +	29. +
3. +	28. +	30. +
4. -	29. -	31. -
5. +	30. +	32. -
6. +	31. +	33. +
7. +	32. +	34. +
8. +	33. +	35. +
9. +	34. +	36. +
10. +	35. -	37. +
11. +	36. -	38. +
12. -	37. -	39. -
13. -	38. +	40. -
14. -	39. -	41. -
15. +	40. -	42. +
16. -	41. +	43. -
17. +	42. +	44. -
18. -	43. -	45. +
19. +	44. -	46. +
20. -	45. -	47. +
21. -	46. -	48. -
22. -	47. -	49. -
23. -	48. +	50. -
24. +	49. +	51. +
	50. -	52. -
	51. +	53. +
	52. -	54. +
	53. -	55. -
	54. -	56. +
	55. +	57. -
	56. +	58. -
		59. +
		60. +
		61. +
		62. -